

Soybeans for the Piedmont and Mountain Sections of North Carolina



SOYBEAN HAY

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SUMMARY

The soybean has been an important hay, grazing, and soil improving crop in sections of eastern North Carolina for more than a quarter of a century.

Recent variety and culture tests in the Piedmont and Mountain sections indicate that it will become a crop of even more importance in these sections.

The large number of varieties differing in habit of growth and earliness adapts this crop to the production of seed, hay, or pasturage in all sections of the State.

Soybeans can replace cowpeas in all portions of the Piedmont and Mountain sections of the State and will fit in well with the farm practice of these sections.

Soybeans will produce more seed or hay than the cowpea.

They will resist more cold or drouth than the cowpea.

They should be planted much thicker than cowpeas.

Soybeans are better adapted to the improvement of poor soils in the Piedmont and Mountain sections than the winter legumes now used.

They produce good grazing in the fall when permanent pastures and red clover begin to fail on account of dry weather.

Small grain machinery may be used to harvest soybean seed.

Every farm of the Piedmont and Mountain sections should grow some soybeans each year.

Soybeans for the Piedmont and Mountain Sections of North Carolina*

By R. W. WINTERS AND V. R. HERMAN
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The soybean has been considered an important crop in certain portions of Eastern North Carolina for more than a quarter of a century. At the present time it holds a permanent place in this section as a summer legume. Although high priced seed have at times made this crop rival cotton as a money crop, the greatest value has come from its use as a grazing crop, for soil improvement, and for hay. When its culture is better understood by growers of the Piedmont and Mountain sections it is sure to become a crop of even more importance to these sections.

VARIETIES

Soybeans have been cultivated for many centuries and under many different climatic conditions. During this time several hundred varieties have been produced. These varieties differ in size and shape of plant, earliness, size, and color of seed, and many other qualities. Certain varieties are high producers of seed, some are especially good for hay production and grazing, while others are well for all of these purposes. Several varieties have been grown in the foot rows at the Mountain Branch Station, near Swannanoa, to compare the yields of seed and hay, and the number of days required to mature them. The table below contains the average results from three tests which included the varieties best suited to the Mountain section.

SOYBEAN VARIETIES FOR THE MOUNTAIN SECTION
MOUNTAIN BRANCH STATION, SWANNANOA, N. C.

For Seed			For Hay		
Variety	Number of Days to Mature Seed	Yield of Seed Per Acre in Bushels	Variety	Number of Days to Mature Seed	Yield of Hay Per Acre, Pounds
Medium Yellow.....	146	19.38	Virginia.....	124	5224
Haberlandt.....	147	18.20	Wilson.....	124	5180
Austin.....	147	16.77	Medium Yellow.....	119	4560
Virginia.....	147	15.25	Austin.....	126	4133
Wilson.....	146	14.48	Haberlandt.....	123	3920
Manchu.....	134	14.21	Manchu.....	118	2810
Black Eyebrow.....	134	13.16	Black Eyebrow.....	118	2457

All of these tests were made on a loamy valley soil which requires a longer time to mature soybeans than the average uplands. On the average uplands

*The variety and culture work reported in this CIRCULAR was conducted in coöperation with the Office of Forage Crop Investigations of the United States Department of Agriculture.



A GOOD CROP OF SOYBEAN HAY GROWN FROM BROADCAST SEEDING



HARVESTING SOYBEAN HAY IN THE MOUNTAINS

the time required would be eight to ten days less, and on the lighter soils twelve to fifteen days less than the time given in the table above. Similar tests were made on the Piedmont Branch Station farm near Statesville.

SOYBEAN VARIETIES FOR THE PIEDMONT SECTION

PIEDMONT BRANCH STATION, STATESVILLE, N. C.

For Seed			For Hay		
Variety	Number of Days to Mature Seed	Yield of Seed Per Acre in Bushels	Variety	Number of Days to Mature Seed	Yield of Hay Per Acre, Pounds
Mammoth Yellow.....	138	16.62	Tar Heel Black.....	112	3441
Haberlandt.....	119	13.96	Mammoth Yellow.....	115	3066
Tar Heel Black.....	137	13.33	Haberlandt.....	94	2749
Virginia.....	119	12.87	Chiquita.....	104	2674
Wilson.....	119	9.97	Virginia.....	94	2330
Chiquita.....	130	7.44	Arlington.....	95	2250
Arlington.....	119	7.05	Wilson.....	94	1967
Black Eyebrow.....	116	6.82	Black Eyebrow.....	90	1110

THE USE OF SOYBEANS IN THE ROTATION

Our State is unusually blessed with the number of legumes that are adapted to our climates and systems of agriculture. Our greatest problem lies in the use of these various legumes in their proper places and for the purpose each is best adapted. Among the legumes generally used in the Piedmont and Mountain sections are red clover, crimson clover, sweet clover, cowpeas, soybeans, and, in limited areas, the velvet bean. In what ways can the soybean replace or fit in with these crops in the regular rotations of these sections of the State? Red clover is no doubt the most generally grown legume of the upper Piedmont and Mountain region. When grown on good land and sufficiently limed, red clover has no superior as a cover crop or hay crop. On such soils soybeans would probably never come in the rotation except for the production of hay when the clover crop failed. The use of such land for soybeans would also be justifiable when the crop is to be harvested for seed and saved or sold as planting seed. The soybeans may be grown on land that is too poor in fertility or lime to grow a good crop of red clover, and may be used to advantage to bring up such soils to a point where a good crop of red clover may be grown. Soybeans will not take the place of our winter legumes but their use will make it possible to put our soils in better shape to grow winter legumes.

Among the summer legumes such as cowpeas and velvet beans the soybean will find its principal competitors. In what ways can the cowpea compete with soybeans in the Piedmont and Mountain sections? In order to answer this question a large number of tests have been conducted on the Branch Station Farms at Statesville and Swannanoa, to compare the yields of seed and hay from these two crops. The soybeans and cowpeas were planted in three-foot rows and



SOYBEAN HAY CURING IN COCKS. THIS METHOD WILL GIVE SPLENDID RESULTS IN DRY WEATHER, BUT IS NOT SO SURE AS CURING IN VENTILATED STACKS SHOWN IN THE NEXT PICTURE



CURING SOYBEAN HAY IN VENTILATED STACKS. IF THE STACKS ARE SHAPED SO AS TO SHED RAIN THIS METHOD WILL CURE HAY IN BAD WEATHER

given the same attention throughout. One plat of each was harvested for seed and one for hay. The following table contains the results of these tests at Swannanoa :

YIELD OF SEED AND HAY FROM COWPEAS AND SOYBEANS

MOUNTAIN BRANCH STATION, SWANNANOA, N. C.

Cowpeas	Yield of Seed, Bushels Per Acre	Yield of Hay, Pounds Per Acre	Soybeans	Yield of Seed, Bushels Per Acre	Yield of Hay, Pounds Per Acre
Groit.....	5.06	4010	Virginia.....	15.25	5225
Early Red.....	6.87	2080	Haberlandt.....	18.20	3920
Taylor.....	5.89	2700	Manchu.....	14.21	2810
Average.....	5.94	2930	Average.....	15.89	3985

In these Mountain section tests the best varieties of soybeans yielded nearly three times as much seed as the best varieties of cowpeas, and over a thousand pounds more hay per acre. When planted in two- to three-foot rows and given two or more cultivations the soybean is by far the superior crop for seed or hay production.

In the tests at Statesville the best varieties of soybeans and cowpeas were compared in the same way.

YIELD OF SEED AND HAY FROM COWPEAS AND SOYBEANS

PIEDMONT BRANCH STATION, STATESVILLE, N. C.

Cowpeas	Yield of Seed, Bushels Per Acre	Yield of Hay, Pounds Per Acre	Soybeans	Yield of Seed, Bushels Per Acre	Yield of Hay, Pounds Per Acre
Groit.....	12.50	2482	Mammoth Yellow.....	16.62	3066
Monnetta.....	5.59	3059	Haberlandt.....	13.96	2749
Early Red.....	12.38	2192	Virginia.....	12.87	2330
Average.....	10.16	2578	Average.....	14.48	2816

These results are not quite so striking as those of the mountain test, but show clearly that soybeans are superior to cowpeas in seed and hay production when planted in rows and given some cultivation.

In the past the cowpea has been used to follow small grain as a hay or soil improvement crop. In a large portion of the Mountain section and in a part of the Piedmont section the time is too short and the fall too dry to make this worth while, unless seed and labor are cheap. In portions of the Piedmont section this practice will bring good returns in hay or material for soil im-



SPECIAL SOYBEAN HARVESTER THRESHING THE BEANS IN THE FIELD, LEAVING THE
STALKS AND HULLS FOR PASTURAGE AND SOIL IMPROVEMENT



A FIELD OF SOYBEANS READY TO BE HARVESTED FOR SEED

provement. Recent studies conducted on the station farms at Raleigh and Statesville indicate that soybeans are superior to cowpeas for this purpose when planted in rows, drilled or broadcast, if planted thick. (See Rates of Seeding, page 13.)

With the exception of a limited area of the sandy soils of the Piedmont section the soybean will be found a more profitable crop for soil improvement, hay or pasture than the velvet bean.

During August and September there is usually a lack of grazing material in the Piedmont pasture on account of the close grazing during the summer and the dry weather usually following. The soybean as a grazing crop for hogs or cattle is particularly adapted to fill in this period. No other summer legume will produce as much food at this time as soybeans. Plant them as early after May 15 as possible.

SOYBEANS FOR HAY

The large yield of hay and the high food content is certain to give this crop an important place in all sections of the State. This will be especially true in sections adapted to livestock production. As will be seen from the table below, a hundred pounds of soybean hay contains more actual food than the same amount of red clover or alfalfa hay.

FOOD CONTENT OF HAYS COMPARED*

	Protein	Carbo- hydrates	Fats
Soybean hay.....	13.9	36.8	5.0
Red Clover hay.....	12.3	31.1	3.3
Alfalfa hay.....	13.3	40.2	2.0
Oat hay.....	9.3	39.0	2.3
Cowpea hay.....	15.8	40.2	2.2

Soybeans are usually cut for hay when the lower pods are full grown, but still green. The stage of cutting will vary with the weather conditions. A long drought coming at the time of blooming will usually cause shedding of the leaves. In such case it is best to cut them before too many of the leaves have shed. Because of its upright growth the soybean is more easily harvested for hay than the cowpea. When planted thick, 90 to 120 pounds broadcast, 75 to 90 pounds with the grain drill, and 50 to 60 pounds in two-foot rows they will make more hay and will be more easily cut with the mowing machine. When planted too thin the stems may grow too coarse.

Soybean hay is not very difficult to cure. It should be cut after the morning dew has dried, and the vines allowed to wilt. When thoroughly wilted but not so dry that the leaves will crumble the hay is raked in rolls and stacked on ventilated stacks in the field, or to the side of the field if the land is to be broken soon after the hay crop is taken off.

*The figures represent pounds of food materials in 100 pounds of hay which contains fifteen per cent moisture.



SMALL QUANTITIES OF SOYBEANS MAY BE CUT OR PULLED BY HAND AND THRESHED WITH A FLAIL



SOYBEANS HARVESTED FOR SEED WITH A REAPER-AND-BINDER

SEED PRODUCTION

The scarcity and high price of seed from suitable varieties have in the past prevented a more general use of soybeans in the Piedmont and Mountain sections of our State. Some of the varieties best suited to these sections may be secured in considerable quantities this season and at a reasonable price.

The demand for soybean seed of the early varieties in this and other states should make the production of good seed profitable in our Piedmont and Mountain sections. Under favorable conditions the better varieties have yielded between 15 and 25 bushels per acre. On land that produces 30 to 40 bushels of corn per acre one should secure 15 to 20 bushels of beans.

The method of harvesting seed depends upon the amount grown. Small quantities may be pulled up by hand and threshed with a flail. Several special machines are now being used to harvest larger areas. (Write for the circular on soybean harvesters.) These soybean harvesters thresh the beans in the field, leaving the stalks standing for pasturage and soil improvement. Seed gathered in this way are mixed with hulls and small pieces of stalks, so it is necessary to screen them after the harvesting is done. These harvesters save from 60 to 75 per cent of the seed, the remainder being scattered on the ground or left on the stalk. The seed left in the field are usually eaten by hogs or cattle pastured after harvesting. In order to secure good results from these machines the pods must be dry. When moist from dew or recent rains the pods are tough and will not thresh well with any machine.

In the Mountain and Piedmont sections where small grain is grown it will be best to use the small grain machinery for harvesting soybeans. The reaper and binder, reaper, or mowing machine may be used to advantage. In fact, large soybean growers have used these implements successfully for several years. In order to use the reaper and binder or mowing machine most successfully, the beans should be planted thick so that the stalks will not grow too coarse. When harvested in this way the beans are cut just before the top pods turn brown. If the pods and stalks are allowed to become dry before cutting there will be some loss from shattering. When cut with a reaper and binder the bundles are stacked like wheat or oats and allowed to dry. When cut with the mowing machine the buncher attachment is used and the vines placed in small cocks to dry. The threshing may be done on an ordinary grain thresher or with a corn shredder. The vines and pods should be thoroughly dry when the threshing is done. The cylinder of the thresher should be run at a slower speed than is used for threshing small grain. A speed of 600 revolutions per minute with a portion or all of the concaves taken out, has given good results. Unless this precaution is taken a large portion of the beans will be cracked. It is customary among some of the growers of the Coastal Plain section to vale the finer portions of the straw and pods and use the coarser materials for bedding or feeding cattle. The finer portions usually come out as tailings and consist of broken pods, small stems and a few seed that stick to the pods. When not damaged by wet weather this material is readily eaten by all livestock.

SOYBEANS FOR SOIL IMPROVEMENT

The general practice of turning under red clover in portions of our Mountain and Piedmont sections is good proof that the turning under of legumes pays.



HARVESTING SOYBEANS WITH A REAPER



THRESHING SOYBEANS WITH A GRAIN THRESHER. TO AVOID CRACKED BEANS THRESH ONLY WHEN THE BEANS ARE THOROUGHLY DRIED, TAKE OUT A PORTION OF ALL OF THE CONCAVES AND REDUCE THE CYLINDER SPEED TO TWO-THIRDS THAT USED FOR SMALL GRAIN

Some of our soils can never be improved by this method, because they are too poor or are otherwise not adapted to the growth of red clover. Such soils need improvement more than those that will grow red clover successfully. In such cases the soybean will prove an excellent crop. On the poorest soils the soybeans should be planted in two- to three-foot rows, fertilized with a mixture of 200 to 300 pounds of acid phosphate, and 50 to 75 pounds of nitrate of soda. Inoculate the seed and plant them thick. If the soil is thoroughly prepared, two or three cultivations will be sufficient. The crop may be turned under when the lower pods are full grown or it may be pastured to hogs or cattle and then turned under. (Write for the Extension Circular on "Soybean Pastures for Hogs.") In a large number of cases splendid results have been secured from broadcasting, when the seed were sown thick (90 to 120 pounds per acre). A few growers of the Piedmont section who have had considerable experience with soybeans consider the broadcasting or drilling thickly with the grain drill the best method for soil improvement.

One hundred pounds of soybeans, including stems, roots, leaves and seed, contain* \$1.54 worth of fertilizing materials. A ton of such material would be worth \$30.80 for the plant food it contains. The value of such crops for soil improvement cannot be judged by the actual plant food they contain, for in addition to the plant food there is a large amount of organic matter added to the soil. If the crop is grazed to livestock a double benefit is secured.

CULTURE OF SOYBEANS

The culture of soybeans is about the same as for cowpeas, except the soybean requires a better seed bed. When seeded in a poorly prepared seed bed or planted too deep the soybean usually gives a poor stand. The seed should not be planted more than 1 to 1½ inches deep.

When grown for seed or for grazing, soybeans are usually grown in narrow rows and cultivated. Some growers of the Piedmont section who have had considerable experience with the soybean recommend broadcast plantings for all purposes. Whatever method of seeding used it should be kept in mind that the thick seeding will usually give the best results for hay or seed production. Poor stands are usually due to the planting of poor seed or planting too few to the acre. Be sure that the seed you buy will give a good germination and plant them thick.

In order to test out the best rates of broadcast seeding several plantings have been compared at the Mountain Branch Station, near Swannanoa. Broadcast plats were sown at the rates of 30, 60, 90, and 120 pounds of seed per acre. In these tests the 90 and 120 pound seedings produced the largest yields of actual soybean hay. From the plats receiving the lighter seedings the hay was principally weeds. Tests were also made with close and broad spacing of plants in the rows.

The seedings were made thick and the young plants thinned to 3, 6, and 12 inches in the row. As will be seen from the table below the close spacing in the row will yield a greater amount of seed or hay.

* The fertilizing value of soybeans figured on the basis of 35 cents per pound for nitrogen, 6 cents for phosphoric acid and 30 cents for potash.



THRESHING SOYBEANS AND BALING THE TAILINGS FOR HAY. THE COARSE STEMS ARE LEFT FOR BEDDING



SOYBEAN VARIETIES GROWN IN BUNCOMBE COUNTY

SOYBEAN SPACING TEST
EXPERIMENT STATION FARM, WEST RALEIGH, N. C.
1915, 1916, and 1917

Variety	Distance Between Plants in Inches	Yield of Seed in Bushels Per Acre	Yield of Hay Per Acre in Pounds
Haberlandt.....	3	14.42	2781
Haberlandt.....	6	12.83	2635
Haberlandt.....	12	10.64	2037
Virginia.....	3	13.64	2465
Virginia.....	6	13.07	2371
Virginia.....	12	10.77	1707
Mammoth Yellow.....	3	22.07	3370
Mammoth Yellow.....	6	20.94	3276
Mammoth Yellow.....	12	20.54	3161

The best results will be secured when seedings are made at the rate of 50 to 60 pounds of beans per acre in two-foot rows, and 35 to 40 pounds in three-foot rows. The yield of seed will usually be greater from row plantings.

The best time to plant soybeans varies with the climate of the locality. Soybeans will stand almost as much cold as corn so could be planted soon after corn is planted. The early seedings will give the best results. At the Mountain Branch Station our best results have been secured from seedings made between May 1 and June 1.

DATE OF SEEDING SOYBEANS
MOUNTAIN BRANCH STATION, SWANNANOA, N. C.
1915 and 1917

Variety	Date of Seeding	Yield of Seed, Bushels Per Acre	Yield of Hay, Pounds Per Acre
Haberlandt.....	May 1	12.09	5070
Haberlandt.....	May 15	12.46	5040
Haberlandt.....	June 1	10.58	4515
Haberlandt.....	June 15	10.13	4470

The fact that soybeans can take a part of their nitrogen from the air is no reason why they should not receive additional plant food in the form of commercial fertilizers. If we wish to get the most good from the soybean in the Piedmont and Mountain sections they should receive a mixture of 200 to 300 pounds of acid phosphate and 50 to 75 pounds of nitrate of soda per acre, or its equivalent in other forms of manure. When the beans are to be grown on soil that has not previously grown soybeans it is best to inoculate the seed before planting.

